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E.0 SAMPLING AND ANALYSIS PLAN

This *Sampling and Analysis Plan* (SAP) section presents the proposed plan to monitor and document the implementation of the soil and groundwater response at the Site. This SAP has been developed in accordance with guidelines developed by the Department of Toxic Substances Control (DTSC) *Waste Evaluation Unit Regulation Guidance No. 43 - Sample Plans, Collection and Management*, the United States Environmental Protection Agency's *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods* (USEPA, 1995) and the ASTM D 6044-96 *Standard Guide for Representative Sampling for Management of Waste and Contaminated Media*.

E.1 FIELD SAMPLING PLAN

Response actions have been recommended to address the “unreasonable risk” posed by: total petroleum hydrocarbons (TPH) as diesel (TPHd) and motor oil (TPHmo) in soil above preliminary remedial goals (PRGs); tetrachloroethene (PCE) and 1,4-dioxane in soil gas above PRGs; and PCE, trichloroethene (TCE), and cis- 1,2-dichloroethene (herein referred to as DCE) in groundwater above drinking water standards.

Based on a residential land use scenario, the recommended response actions include: excavation and offsite disposal of approximately 600 cubic yards of soil to address TPH in soil and PCE and 1,4-dioxane in soil gas. Approximately 300 cubic yards of soil will be excavated to approximately three-feet below ground surface in the vicinity of the wash rack and the drop inlet near the loading dock to remove TPH in soil above the PRG of 100 mg/kg. Approximately 300 cubic yards of soil will be excavated to approximately eight-feet below ground surface in the vicinity of the loading dock to remove PCE and 1,4-dioxane in soil gas above their respective PRGs of 180 g/m^3 and 2,500 g/m^3 .

Quarterly groundwater monitoring will be conducted to document the residual levels of VOCs in groundwater. Institutional controls will be implemented to restrict use of the groundwater beneath the Site without treatment. This *SAP* presents the sampling methodology and quality control procedures for post-excavation sampling and characterization.

E.1.1 Post-Excavation Soil and Soil Gas Sample Collection

As excavation activities progress, samples will be collected using a combination of systematic random sampling and focused “hot spot” or stratified sampling in areas showing signs of contamination, e.g., odors, soil discoloration, proximity to suspected source areas or other indications. Field-testing will be used to determine if the excavation has been advanced enough to warrant collection of confirmation samples.

The soil and soil gas samples will be collected using an imaginary rectangular grid to which alphanumeric designations will be assigned, with numbers designating the vertical axis and letters designating the horizontal axis (Figure E-1). Soil samples will be collected from the floor of each cell of the imaginary sampling grid or from “hot spots,” on a systematic random basis. Soil samples will also be collected from at least four sidewalls of the excavation or one sample each 40 feet of excavation wall. Soil gas samples will be collected from below the floor of the excavation. The distances between grid lines will be approximately 20 feet. The dimensions of the grid will be adjusted during excavation as necessary, to allow for the collection of an adequate number of samples from each excavation.

E.1.1.1 SOIL SAMPLING METHODOLOGY

The soil will be excavated on a slope of three horizontal to one vertical or flatter or as deemed safe by the contractor’s Competent Person. Soil samples will be collected from the floor of the excavations by either driving a sampling tube into the soil or scooping soil into appropriate sample containers. Sidewall and floor soil samples will be collected using the excavation equipment in areas where it is not practical or safe to enter the excavation; the samples will be

collected by driving a 6-inch long by 2-inch diameter brass tube into soil within the excavator bucket. The location at which the excavator bucket removed the soil sample will be recorded as the “confirmation sample location.” The ends of the brass-lined tubes will be covered with Teflon sheets and plastic end caps, labeled, sealed in a plastic bag and placed in a chilled ice chest. The soil samples will be transported to a state-certified laboratory for analysis, following ASTM D 4840 chain-of-custody protocols. The analytical methods to be used will be identified on the chain-of-custody form.

E.1.1.2 SOIL GAS SAMPLING METHODOLOGY

Soil gas samples will be collected following the procedures outlined in ASTM D 5314 and the California Environmental Protection Agency’s Advisory – *Active Soil Gas Investigation* (CalEPA, 2003). A 2-inch diameter steel push rod outfitted with a disposable perforated tip will be driven into the subsurface below the floor of the excavation to approximately three inches past the target sample depth using hydraulic direct-push equipment. A length of disposable ¼-inch diameter polyethylene tubing will be attached to the retractable tip within the push rods and connected to a peristaltic pump at the ground surface. The steel rod will then be retracted approximately three inches to expose the perforated tip, allowing soil gas to enter the tubing. A bentonite seal will then be placed around the contact between the ground surface and the steel rod.

Prior to soil gas sample collection, a purge volume test will be performed for each unique geologic stratum, which consists of removing approximately one, three and seven tubing volumes of soil gas using the peristaltic pump, while field screening the purge effluent. The purge effluent will be field screened for organic vapors using a photo-ionization detector (PID) calibrated with isobutylene gas.

Following purging activities, the tubing will be attached to a laboratory prepared one-liter Summa canister using airtight stainless-steel fittings and outfitted with a flow control valve. The

flow control valve will then be opened slowly to draw the vapor sample from the target depth. Prior to and following sample collection, the Summa canister atmosphere will be measured with a pressure gauge and recorded on field data forms. Leak detection monitoring will be conducted during soil gas sampling by applying a compressed tetrafluoroethane gas to the bentonite seal and connection fittings. The soil gas samples will be transported to a state-certified laboratory for analysis, following ASTM D 4840 chain-of-custody protocols. The analytical methods to be used will be identified on the chain-of-custody form.

E.1.1.3 LABORATORY ANALYTICAL METHODOLOGY

Post-excavation soil and soil gas samples will be submitted for chemical analysis to KPrime, Inc., of Santa Rosa, California, a California Department of Health Services (DHS) Environmental Laboratory Accreditation Program (ELAP) certified laboratory. Analytical Science of Petaluma, California will be used as the secondary laboratory for quality control analyses. The samples will be transported to the analytical laboratory following ASTM D 4840 chain-of-custody protocols. The analytical methods to be used in evaluating soil and soil gas samples collected at the Site are summarized in Table E-1 and include:

- ?? USEPA Method Modified 8015M – Total Petroleum Hydrocarbons, quantified as diesel and motor oil for soil; and
- ?? USEPA Method TO-14A/TO-15 – VOCs, including PCE and 1,4-dioxane for soil gas.

The minimum detection limits for the analytical methods include: 10 milligrams per kilogram (mg/kg) for TPH using USEPA 8015M; and 6.78 micrograms per cubic meter ($\mu\text{g}/\text{m}^3$) for VOCs using TO-14A/TO-15. The laboratory turnaround time for sample analysis will primarily be standard-turnaround time, although expedited turnaround time will be used depending on the information needs of the remediation effort and costs of remediation equipment and personnel, e.g., if the analytical turnaround time delays excavation activities, the turnaround time will be accelerated.

E.1.2 Previously Uncharacterized Materials

In the event that previously uncharacterized materials are observed during excavation, samples will be collected and analyzed. Prior to proceeding with sampling, notification will be provided to the DTSC. The depth, number and suite of analyses will be determined in coordination with DTSC staff and the waste management facilities. If the laboratory analysis reveals chemicals of concern (COCs) that do not have remedial goals outlined in the *Response Plan*; and if the concentration of the new COCs contain chemicals above appropriate screening levels, such as the California Human Health Screening Levels (CHHSLs) or USEPA Region IX residential PRGs, residential remedial goals will be calculated for these chemicals. If supplemental response actions appear to be warranted, based on a comparison of the analytical testing and PRGs, this material will be removed to achieve the PRGs in accordance with the excavation and confirmation sampling requirements outlined in this Response Plan or a supplemental response plan will be developed and presented to the DTSC for review and approval.

In the event that COCs are detected in confirmation soil samples above PRGs in areas of the Site where further excavation is not feasible due to building or safety constraints, e.g., structural integrity of existing building structures or roads would be threatened, it may be necessary to leave such materials in-place. If soil containing COCs in excess of the Site-specific remedial goals are left in-place due to obstructions, provisions will be added to the deed restriction for removal of the affected soil if the obstruction is removed in the future, thereby enabling access to the soil containing COCs above PRGs.

E.1.3 Stockpiled Soil Sample Collection

In the event that the excavated soil is stockpiled, soil samples will be collected from the soil stockpile for characterization prior to disposition. Four discrete samples will be collected from each 200 cubic yards of soil. The discrete soil samples will be collected from at least three inches below the surface of the stockpile by hand pushing brass liners into each 50 cubic yard

portion of the stockpile. The ends of the brass liners will be capped with Teflon[®] sheets and plastic end caps, labeled and placed in a chilled cooler for transportation to a DHS ELAP certified laboratory pursuant to ASTM D 4840 chain-of-custody protocols. The soil samples will be analyzed for the constituents outlined by the waste management facility that profiles the soil for disposition.

E.1.4 Imported Soil Characterization

In the unanticipated event that soil is imported from offsite for use as backfill material, it will be sampled prior to delivery to the Site. Chemical analysis and sampling frequency will be based on the source of the imported soil. If the data indicate that the quality of the imported soil meets the remedial goals, then the imported soil may be used onsite.

E.1.5 Groundwater Sample Collection

During excavation activities, a grab groundwater sample, W-30, will be collected in the loading dock. The soil boring will be advanced to approximately five feet past the first encountered groundwater using hydraulic direct-push equipment operated by a California State C-57 licensed well drilling contractor. The soil boring will be drilled using two-inch diameter push rods equipped with a four-foot long, two-inch diameter core barrel outfitted with an acetate liner insert.

Following completion of the boring, temporary monitoring wells will be constructed within the annulus of the borehole using ¾-inch diameter Schedule 40 PVC pre-pack well casing. The base of the well casing will be constructed using five feet of ¾-inch diameter Schedule 40 PVC pre-packed slotted well screen with 0.010 inch slots. The slot screen and filter pack size has been selected based on Site geology. The top of the pre-pack well screen will be outfitted with ¾-inch diameter Schedule 40 PVC blank casing to the ground surface. Groundwater samples will be collected from the temporary well using low flow sampling techniques (USEPA, 1996). The groundwater samples for analysis of VOCs will be collected using laboratory prepared zero

headspace 40-milliliter glass VOA vials preserved with hydrochloric acid. Groundwater samples collected for analysis of 1,4-dioxane will be collected using laboratory prepared one-liter amber jars.

Following sample collection, the primary samples will be labeled, placed in a chilled cooler at 4 degrees Celsius and transported to KPrime Laboratories of Santa Rosa, California, a DHS ELAP certified laboratory, for chemical analysis following the chain-of-custody procedures outlined in ASTM D 4840. Travel blanks and equipment blanks, as appropriate, will be transported with the primary samples to KPrime for chemical analysis. A duplicate sample will also be collected and submitted to Analytical Science of Petaluma, California, a DHS ELAP certified laboratory, for chemical analysis following the chain-of-custody procedures outlined in ASTM D 4840. The groundwater samples will be analyzed for VOCs by USEPA Method 8260B/8021 and for 1,4-dioxane by USEPA Method 8270C-SIM (Table E-1).

Following the collection of groundwater samples from the temporary monitoring well, the pre-packed well screen will be removed from the boring annulus. The boring annulus will then be sealed to the surface with Portland cement grout and inspected by the Alameda County Public Works Agency pursuant to the permit conditions.

E.1.6 Groundwater Monitoring

Groundwater sampling will be conducted to monitor offsite contributions of PCE, TCE and DCE. Groundwater samples will initially be collected quarterly to measure the chemical concentration as a function of seasonal variation. After one year of quarterly groundwater monitoring, the monitoring frequency will be re-evaluated. In addition, groundwater samples will be collected from the onsite water supply well prior to abandonment, for analysis of VOCs and 1,4-dioxane (Table E-1). The groundwater samples will be collected at approximately 25 feet, 50 feet, 75 feet and 100 feet below ground surface from the onsite water supply well.

Groundwater samples will be collected from the monitoring wells, MW-1 to MW-4, and the onsite water supply well using low flow sampling techniques (USEPA, 1996). During purging, groundwater parameters including pH, dissolved oxygen (DO), temperature, electrical conductivity and turbidity will be measured in the field to monitor stability of parameters indicating the presence of formation water. Depth to water will be monitored during purging activities and flow rates adjusted accordingly to minimize drawdown to within 0.33 feet (USEPA, 1998).

Groundwater samples will be collected once the indicator parameters measured during purging have stabilized for three consecutive readings, as follows: plus/minus 0.1 Standard Units (S.U.) for pH; plus/minus 3 percent for specific conductance; and plus/minus 10 percent for turbidity and DO (USEPA, 1996).

Following purging of the groundwater, samples will be collected into laboratory supplied containers, labeled, placed in a chilled cooler at 4 degrees Celsius and transported to a DHS ELAP certified laboratory pursuant to ASTM D 4840 chain-of-custody protocols. Duplicate samples, travel blanks, field blanks and equipment blanks, as appropriate, will be transported with the primary samples to the analytical laboratory. Groundwater samples collected for analysis of VOCs will be collected using zero headspace 40-milliliter glass VOA vials preserved with hydrochloric acid. Groundwater samples collected for analysis of 1,4-dioxane will be collected using laboratory prepared one-liter amber jars. The groundwater samples will be analyzed within the laboratory holding period of 14 days for VOCs using USEPA Method 8260B, but reported using the 8021 list and for 1,4-dioxane using USEPA Method 8270C-SIM.

Standard laboratory turnaround time will be used for samples collected during routine groundwater monitoring. A summary of the groundwater monitoring well sampling schedule and chemical analyses are presented in Table E-2. The groundwater remediation program will be re-evaluated after one year to evaluate the adequacy of the sampling frequency and monitoring well locations.

E.1.7 Data Quality Objectives

Soil, soil gas and groundwater sampling analytical results will be evaluated in accordance with the data quality objectives (DQOs) to determine whether an adequate number of samples have been collected. To assess the quality of the data from sampling, quality control samples will be collected during field activities. Duplicate samples and equipment blanks, as outlined in Section E.2, will be submitted with primary samples to the analytical laboratory under the same documentation and custody procedures as the original samples they will accompany.

E.2 QUALITY ASSURANCE PROJECT PLAN

This *Quality Assurance Project Plan* (QAPP) has been developed to guide collection, handling and validity of data collected during implementation of the *Response Plan*. The QAPP includes a quality assurance and quality control (QA/QC) plan. The overall purpose the QAPP is to create a project specific guidance document for generating data of a quality that is consistent with the needs of the project. Elements of the plan include discussions on the collection and handling of samples, the laboratory methods used to analyze the samples, reporting requirements, detection limits, laboratory requirements for internal QA/QC (e.g., accuracy measured by spike sample recovery and precision measured by comparing duplicate spike samples) and methods for identifying and addressing possible problems with the integrity of the data.

E.2.1 Field Equipment Calibration

A Thermo Instruments Inc. OVM, Model 580B, PID will be used to monitor organic vapors in air during remedial work. The PID will be calibrated prior to each use with isobutylene standard gas (98 parts per million isobutylene plus or minus 2 percent) according to the procedures outlined in the instrument handbook.

Respirable dust air monitoring will be performed using a Monitoring Instruments for the Environment, Inc. (MIE) data logging real time monitor, model PDR-1000 respirable air monitor

(RAM). The PDR 1000 is designed to measure the concentration of airborne particulate matter using a high sensitivity nephelometer (photometer) using a light scatter sensor. Sensitivity of the PDR 1000 is reported to range from 0.001 milligrams per cubic meter (mg/m^3) to $400 \text{ mg}/\text{m}^3$. The RAM will be calibrated daily using a RAM calibration pouch.

E.2.2 Laboratory Calibration Procedures

Laboratory instrument calibration is carried out to ensure that the analytical equipment is performing at the required sensitivity with acceptable linearity. Frequency of calibration is determined by manufacturer's guidelines, analytical method, or client-specified requirements. Calibration records will be prepared and maintained for each piece of analytical equipment and made available for inspection upon request. Copies of the laboratory quality control evaluations will be included with the *Response Completion Report*.

E.2.3 Duplicate Samples

Duplicate samples will be collected and analyzed to check for sampling consistency. Duplicate samples will be collected immediately after the primary sample using the same equipment and procedure. Ten percent of the samples collected for each analysis will be duplicate samples.

E.2.4 Equipment Blanks

Equipment blanks will be collected and may be analyzed to detect potential cross-contamination of sampling equipment used at more than one sampling location. An equipment blank will be collected for each type of non-disposable sampling equipment, as appropriate.

E.2.5 Data Quality Assessment

The DQOs for the implementation of the soil and groundwater response actions are to report concentrations of chemicals in soil and groundwater within the accuracy and precision stipulated

by the USEPA methods. In addition, the DQOs include collecting and analyzing samples that generate data for each chemical at concentrations below its respective remedial goal. A Data Quality Assessment (DQA) test will be conducted following sampling to ensure that the DQOs (i.e., decision error rate goals) are achieved and to determine whether the original estimate of the number of samples collected was adequate to achieve the DQOs. If sampling DQOs are not met, supplementary sampling may be recommended to achieve DQOs.

E.3 PROJECT DOCUMENTATION

Prior to the use of laboratory analytical data for soil characterization, the laboratory data will be reviewed with respect to quality control and data validation. All documentation forms will be recorded in ink. No documentation will be destroyed or discarded, even if they contain mistakes that require a replacement document. If an error is made on any of these documentation forms, the correction will be made by crossing a single line through the erroneous information without obliterating the original entry. All corrections will be initialed and dated.

Photographs taken during field activities will be noted in the daily report form with the date and time of the photo, location, direction of the photo and description of photograph subject. All documentation related to the *SAP* and *Response Plan* will be identified using the Site address of 22958 Saklan Road, Hayward, California.

E.3.1 Field Notebooks

The sample custodian will maintain a field notebook containing sample collection forms. Each sample collection form will be specific for each sample source and will include the following:

- ?? Sample collection procedures;
- ?? Date and time of collection;
- ?? Date of shipping;
- ?? Sample collection location;

- ?? Sample identification;
- ?? Intended analysis;
- ?? Quality control samples, i.e., travel blanks and duplicate or split samples that may be included with the sample set;
- ?? Sample preservation;
- ?? Name of the sampler; and
- ?? Pertinent observations.

E.3.2 Sample Labels

A sample label will be attached to each sample. In the event that labels are lost, voided, or damaged, it will be noted on the chain-of-custody record. The sample label will include the following information:

- ?? Exact date and time the sample was collected;
- ?? The location of the sample;
- ?? Unique sample identification number with collection depth for soil samples;
- ?? The sampler's name;
- ?? Preservation or other substances introduced into the sample; and
- ?? Remarks or special considerations.

E.3.3 Chain-of-Custody Record

A chain-of-custody record will be used to track the possession of the samples from the time they are collected in the field until the time they are analyzed. Chain-of-custody forms will be maintained with the project records. Chain-of-custody records will contain the following information:

- ?? Site name;
- ?? Signature of collector;

- ?? Date and time of collection;
- ?? Sample identification number(s);
- ?? Number of containers in the sample set;
- ?? Description of the sample and container(s);
- ?? Name and signature of persons, and the company they represent, who are involved in the chain of custody;
- ?? Inclusive date and times of possession; and
- ?? Requested analyses for each sample.

TABLE E-1
PROPOSED LABORATORY ANALYSIS
22958 Saklan Road
Hayward, California

Excavation Area		Sample ID	Estimated Sample Depth ¹	Media	TPHd/ TPHmo	VOCs (including 1,4-dioxane)	VOCs ²	1,4-Dioxane
			(ft bgs)		EPA 8015M*	(TO-14A/ TO-15)	(EPA 8260B)	EPA 8270C-SIM)
TPH in Soil	Floor	B2-F	3	Soil	X	--	--	--
		C2-F	3	Soil	X	--	--	--
		C3-F	3	Soil	X	--	--	--
		D2-F	3	Soil	X	--	--	--
		D5-F	3	Soil	X	--	--	--
		D6-F	3	Soil	X	--	--	--
		D7-F	3	Soil	X	--	--	--
		E6-F	3	Soil	X	--	--	--
		Duplicate	3	Soil	X	--	--	--
	Sidewall	B2-W	1.5	Soil	X	--	--	--
		C2-W	1.5	Soil	X	--	--	--
		C3-W	1.5	Soil	X	--	--	--
		D2-W	1.5	Soil	X	--	--	--
		D5-W	1.5	Soil	X	--	--	--
		D6-W	1.5	Soil	X	--	--	--
		D7-W	1.5	Soil	X	--	--	--
		E6-W	1.5	Soil	X	--	--	--
		Duplicate	1.5	Soil	X	--	--	--
VOCs in Soil Gas	Floor	E1	8	Soil Gas	--	X	--	--
		E-2	8	Soil Gas	--	X	--	--
		E-3	8	Soil Gas	--	X	--	--
		E-4	8	Soil Gas	--	X	--	--
		Duplicate	8	Soil Gas	--	X	--	--
VOCs in Groundwater	--	W-15	25	Water	--	--	X	X
			50	Water	--	--	X	X
			75	Water	--	--	X	X
			100	Water	--	--	X	X
		W-30	18	Water	--	--	--	X
		Duplicate	--	Water	--	--	X	X

Notes:

¹: Final sample depth will be determined following excavation

²: VOCs analyzed using EPA method 8260B will be reported using the 8010 list

TPHd: Total petroleum hydrocarbon as diesel

TPHmo: Total petroleum hydrocarbon as motor oil

VOCs: Volatile organic compound

*: with silica gel cleanup

ft bgs: Feet below ground surface

TABLE E-2
SUMMARY OF GROUNDWATER SAMPLING SCHEDULE AND ANALYSIS
22958 Saklan Road
Hayward, California

Method	Analysis	Groundwater Monitoring Wells ¹			
		MW-1	MW-2	MW-3	MW-4
Schedule		Quarterly	Quarterly	Quarterly	Quarterly
Laboratory Parameters					
EPA 8260B/8021	VOCs	X	X	X	X
Field Parameters					
Field	Depth to Groundwater	X	X	X	X
Field	Dissolved Oxygen	X	X	X	X
Field	pH	X	X	X	X
Field	Temperature	X	X	X	X
Field	Electrical conductivity	X	X	X	X
Field	Turbidity	X	X	X	X
Field	Oxidation-Reduction Potential	X	X	X	X

Notes:

¹: Re-evaluate groundwater monitoring schedule after 1 year

